The Future is Now: The University of Michigan Opens its New ED-Based Intensive Care Unit

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Last February, after years of groundwork and multidisciplinary collaboration, the University of Michigan began treating patients in its new Emergency Critical Care Center (EC3). This nine-bed intensive care unit embedded within the emergency department (ED)—one of the first of its kind in the United States—was made possible through the vision of department leadership, vigorous support from the university, and a generous gift from the Joyce and Don Massey Family Foundation.

The University of Michigan Health System’s ED matured under more than two decades of leadership by William Barsan, MD, FACEP into a modern academic department, housing a four-year emergency medicine (EM) residency, a fellowship in pediatric EM, and initiatives in wilderness and international EM. Prior to construction of the EC3, the ED received approximately 90,000 patients per year in 90 rooms and three resuscitation bays.

In 2012, incoming EM Chair Robert Neumar, MD, PhD, FACEP came to Michigan with a vision of building the future of critical care, including innovations in research, education, and clinical care. To this end, Neumar recruited Kyle Gunnerson, MD to head a new Division of Emergency Critical Care and Kevin Ward, MD, FACEP to lead the Michigan Center for Integrative Research in Critical Care (MCIRCC). Construction for the EC3 involved completely rebuilding the space occupied by the former pediatric ED after that service was moved to the nearby C.S. Mott Children’s Hospital. This space was redesigned from the ground up to house nine fully equipped single-patient adult intensive care unit (ICU) suites, and the adjacent resuscitation area was expanded to five modern bays. The new resuscitation bays are equipped with custom-designed booms to provide flexible access to monitors, oxygen/suction supplies, power outlets, and lighting. Through a partnership with Storz, Inc, these rooms also include state-of-the-art multimedia support, which allows for the display of monitor and electronic medical record (EMR) data, radiographic images, and images from bedside ultrasound, fiberoptic devices, and video laryngoscopes on large overhead screens. This facilitates unprecedented bedside teaching and clinical supervision opportunities, particularly when large teams are involved and access to the bedside is limited. Multiple cameras in each bay and associated networking technology also support secure video recording, expanded in situ simulation training, remote consultation, and case review.

For the EM-intensivists comprising the new Division of Emergency Critical Care, these modernized resuscitation bays are only part of this exciting new initiative. Located adjacent to the “Resus” area are the nine new ICU rooms that make up the heart of the EC3. This area receives patients who have undergone initial stabilization in the ED but remain critically ill. The driving principle of the EC3 is that these types of patients will benefit from early, attentive, and aggressive care over the course of several hours, which can be challenging to provide in a busy ED. Conventionally, these patients are admitted to an inpatient intensive care unit. However, the era of hospital overcrowding has meant that this process can be substantially delayed, exposing patients with complex multiorgan disease to the risk of deterioration. From a clinical standpoint, the EC3 seeks to provide immediate access to intensive care during this vulnerable phase of critical illness.

The clinical mission of the EC3 is derived from the fact that the volume and complexity of critically ill patients in the ED has increased substantially over the past decade. These patients have time-sensitive pathophysiology and their outcomes predictably
worsen without early access to intensive care. At the time of first assessment, some of these patients will clearly require ICU-level care after leaving the ED, but they frequently encounter logistical delays due to bed availability, or their undifferentiated illness may require additional urgent diagnostic evaluation. Another cohort of patients may transiently improve with early intervention, but then decompensate after admission to a general care ward and require urgent ICU admission. Delays in care and unplanned ICU admission are both associated with worse outcomes. The clinical goal of the EC3 is to provide both aggressive critical care as early as possible for those patients inevitably headed to an inpatient ICU, and also to provide extended resuscitative care and monitoring for those patients who might then be safely admitted to general care. Patients leave EC3 either optimized for admission to the ICU, or with their acutely abnormal physiology stabilized to the point that they will no longer require ICU care. This ultimately yields not only clinical benefits for the individual patient, but also a more efficient use of inpatient ICU resources.

Operationally, the EC3 is staffed around the clock by attending physicians working 12-hour shifts. At present, most of these shifts are filled by the Division’s current roster of newly recruited, dual-boarded EM/critical care medicine specialists. EM faculty members who have undergone a customized two-day Fundamentals of Critical Care Support course (using materials from the Society of Critical Care Medicine) fill the remaining shifts. This single-coverage attending physician supervises a team that includes critical care fellows from all of the medical center’s fellowships, a special cohort of ED physician assistants and ED nurses, as well as respiratory therapists and pharmacists. Starting this summer, the team will also include senior EM residents and fourth year medical students, for which the EC3 will ultimately serve as a core ICU clerkship. Off-service residents will likely be added shortly thereafter.

For all of these learners, the EC3 offers a unique window into the very earliest phases of resuscitative care, including unique exposure to undifferentiated critical illness, the latest in monitoring technology, procedural experience, and bedside ultrasound, all with continuous on-site attending supervision. The design of the EC3 has carefully incorporated features that will benefit learners at all levels. The curricula will make maximum use of the features described above, and will emphasize multidisciplinary team training.

The EC3 would not have been possible without a robust commitment from ED nursing. The cohort of highly motivated ED nurses currently staffing the EC3 attended the American Association of Critical Care Nurses Essentials of Critical Care Nursing course and underwent an eight-week preceptorship in the Medical Center’s inpatient ICUs to gain the baseline experience necessary to deliver the high-intensity care that characterizes the EC3. This spirit of innovation and collaboration from both the nursing and physicians groups makes the EC3 a particularly exciting place to work.

The EC3 also offers unprecedented research opportunities, particularly in its ability to capture data from critically ill patients at an exceptionally early point in their disease process. Most landmark trials in critical care share the common feature of enrollment at the time of ICU admission. This means that the critical first few hours in a patient’s disease and resuscitation—and most of the critical care delivered in the ED—are largely unexamined. The EC3 offers an opportunity to scrutinize and optimize this care, gathering data that extends even into the pre-hospital phase. This can inform the care of critically ill patients across the full spectrum of pathology, in a way that is independent of conventional specialty boundaries. The clinical resources of the EC3 are paired with the Michigan Center for Integrative Research in Critical Care (MCIRCC) to facilitate rapid trial enrollment and large scale epidemiologic, outcomes, and informatics research.

Potential future directions for EC3 include partnering with the University of Michigan’s robust center for extracorporeal life support (ECLS) to provide and study the use of ECLS in cardiac arrest, severe respiratory failure, and other indications. Other areas of active
exploration include critical care telemedicine, high-acuity retrieval medicine, innovations in critical care outcomes research, and quality improvement initiatives, among others.

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